.H ⸴

UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/066,100	01/30/2002	Igor Guskov	01339.0008.NPUS00	6027

7590 11/10/2003	EXAMINER
Robert C. Laurenson	NGUYEN, KIMBINH T

Robert C. Laurenson
HOWREY SIMON ARNOLD & WHITE, LLP
301 Ravenswood Avenue
Menlo Park, CA 94025

ART UNIT	PAPER NUMBER
2671	

DATE MAILED: 11/10/2003   6

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 10/066,100	Applicant(s) GUSKOV ET AL.
	Examiner Kimbinh T. Nguyen	Art Unit 2671

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _30 January 2002_ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-48_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) _43-48_ is/are allowed.

6)☒ Claim(s) _1-42_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _30 January 2002_ is/are: a)☐ accepted or b)☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

    If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

        1.☐ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____ .

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

    a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4)☐ Interview Summary (PTO-413) Paper No(s). _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: .

DETAILED ACTION

1.   Claims 1-48 are pending in the application.

Claim Rejections - 35 USC § 103

2.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

3.   Claims 1-7 and 11-21 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Loop (5,602,979) in view of Krishnamurthy (6,256,038).

Claim 1, Loop discloses forming a base mesh (input mesh M0; col. 6, lines 5-6);

forming one or more higher level meshes (a new meshes M1 and M2; col. 6, lines 8-11)

from the base mesh through regular refinement operations in combination with irregular

operation (isolating irregularities; adding operation; col. 6, lines 5-7; col. 54-63), the

hybrid mesh representation (the resulting spline surface becomes the quadratic B-spline

curve corresponding to the boundary of old mesh M0 (base mesh) comprising the base

mesh in combination with higher level meshes (M2; col. 9, line 54 through col. 10, line

57). Loop does not define the resulting spline surface is a hybrid mesh representation;

however, Krishnamurthy teaches that the hybrid representation is a smooth surface

representation for the fitting function (irregular operation) is a combination of a tenser

product B-spline surface and displacement map; col. 11, lines 5-30). It would have been

obvious to one of ordinary skill in the art at the time the invention was made to

incorporate the hybrid representation as taught by Krishnamurthy into the method of

generating smooth low degree polynomial spline surfaces over irregular meshes of

Loop's teaching for producing the hybrid mesh, because it would create an extremely

high resolution spline surface that completely captures all the surface detail within the

spline surface (col. 11, lines 40-44). **Claims 11 and 12** Loop teaches polygons

(meshes) define a volume; wherein the volume is a cube (cubic Bezier; col. 5, lines 42-

50). **Claims 13 and 14**, Krishnamurthy teaches parameterizing meshes (col. 2, lines 46-

62) and performing irregular operation (approximated operation or fitting operation) after

the parameterization step (col. 2, line 63 through col. 3, line 33).

Claims 2 -6, Loop discloses the base mesh (M0) is a regular mesh (col. 9, lines

27-28); the base mesh is an irregular mesh (col. 6, lines 6-8); the mesh comprises

tessellated polygons (col. 8, lines 61-63); the polygons are quads (quad nets; col. 6,

lines 13-14), are triangles (Bezier triangle; col. 6, line 15), **Claim 7**, Loop does not teach

the polygons are hexagon; however, Loop teaches polynomial spline surface is

constructed of degree 3 as opposed to 6 for bicubic surfaces (col. 5, lines 35-37).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to include the bicubic surfaces as taught by Loop for proving

hexagon polygon, because using polynomial for ray tracing, the shape would render

faster and more robust and generate aesthetically pleasing shapes (col. 14, lines 4-43).

Claims 15 and 16, the rationale provided in the rejection of claim 1 is

incorporated herein.

Claim 17, the rationale provided in the rejection of claims 1 and 8 is incorporated herein. In addition, Krishnamurthy teaches a base mesh comprising patches (col. 2, lines 42-44); at least one of the higher level meshes representing a patch being an irregular mesh (fitting to the patch or irregular mesh or polygonal mesh; col. 2, lines 63-67; col. 3, lines 1-52).

Claims 18 and 19, the rationale provided in the rejection of claims 2 and 3 is incorporated herein.

Claims 20 and 21, Loop teaches a processor readable medium, a memory (col. 7, line 65 through col. 8, line 21).

4.   Claims 8 and 22-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loop (5,602,979) in view of Krishnamurthy (6,256,038) and further in view of Assa et al. (6,313,837).

Claim 8, Assa et al. discloses the base mesh and higher level meshes (hybrid mesh) have a hierarchical relationship (col. 11, lines 55-62; col. 12, lines 56-58; col. 13, lines 64-66). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the hybrid mesh as taught by Assa into the method of generating smooth low degree polynomial spline surfaces over irregular meshes of Loop's teaching for producing the hybrid mesh, because it would provide multilevel resolution in a hierarchical surface (abstract).

Claim 22, Assa et al. discloses a data structure corresponding to a root polygon in a mesh (the original tree or node front of the tree; col. 2, line 41, or ancestor), polygon having vertices (col. 2, lines 61-67), neighboring polygons (col. 2, lines 55-57; col. 10,

line 6), child polygons (leaf or child; col. 13, lines 50-52). Assa does not teach a pointer; however, Loop teaches using a cursor or pointer to select command modes and edit graphic data (col. 8, lines 12-16). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the pointer or cursor as taught by Loop into the data structure of Assa's teaching for using a pointer in the tree data structure, because it would provide more convenient means to input information into the computer system (col. 8, lines 15-16).

Claims 23-31, the rationale provided in the rejection of claims 5-8, 21 and 22 is incorporated herein.

Claims 32-36, the rationale provided in the rejection of claims 20-22 is incorporated herein. In addition, Assa teaches a child polygon (branch or leaf node; col. 12, lines 35-36) having a vertices, a parent (ancestor; col. 13, line 15) polygon (col. 2, lines 64-67). The child polygon is a part of a hybrid mesh (col. 12, lines 27-39); a flag indicating the child has been removed from the mesh (col. 13, lines 46-52).

Claims 37-42, the rationale provide in the rejection of claims 10, 20, 21, 28, 29, 32, 33 and 36 is incorporated herein.

5.   Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loop (5,602,979) in view of Krishnamurthy (6,256,038) and further in view of Gueziec et al. (6,184,897).

Claims 9 and 10, Gueziec et al. discloses irregular operation comprises cutting a hole in a mesh (cu operation; col. 10, lines 8-15) by removing polygons (col. 10, lines 33-34); adding one or more polygons to a mesh (fig. 13, # 13300). It would have been

obvious to one of ordinary skill in the art at the time the invention was made to incorporate the cutting, removing and adding operations as taught by Gueziec into the method of generating smooth low degree polynomial spline surfaces over irregular meshes of Loop's teaching for producing the hybrid mesh, because it would provide multi-resolution of level of detail (col. 3, lines 49-55).

Allowable Subject Matter

6.   Claims 43-48 allowed.

The following is an examiner's statement of reasons for allowance:

Claims 43-48, the closest prior art Guskov et al. "Normal Meshes" (ACM 2000 discloses applying a wavelet transform to transform the hybrid mesh into wavelet coefficients (page 97, the right column, lines 1-14). Guskov does not teach encoding the wavelet coefficients with a progressive encoding algorithm; applying a progressive decoding algorithm to the coded mesh to recover wavelet coefficients

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

7.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Kimbinh Nguyen** whose telephone number is **(703) 305-9683**. The examiner can normally be reached **(Monday- Thursday from 7:00 AM to 4:30 PM and alternate Fridays from 7:00 AM to 3:30 PM)**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

Or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Part II, 2121 Crystal Drive,

Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or

proceeding should be directed to the Technology Center 2600 Customer Service Office

whose telephone number is (703) 306-0377.

November 3, 2003

Kimbinh Nguyen

Patent Examiner AU 2671